

Clutch

Specifications

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Brake Pedal Pivot Nut	54 N·m	40 lb ft
Clutch Actuator Cylinder Bolt	8 N·m	71 lb in
Clutch Pressure Plate Bolt (5-Speed)	20 N·m + 45 degrees	15 lb ft + 45 degrees
Clutch Pressure Plate Bolt (6-Speed)	70 N·m	52 lb ft
Clutch Master Cylinder Nut	20 N·m	15 lb ft
Transmission Bolt (5-Speed)	75 N·m	55 lb in
Transmission Bolt (6-Speed)	50 N·m	37 lb ft

GM SPO Group Numbers

Application	GM SPO Group Number
Clutch Actuator Cylinder	0.000
Clutch Driven Plate	0.000
Clutch Master Cylinder	0.000
Clutch Pedal Arm	0.000
Clutch Pedal Position Switch	4.000
Clutch Pilot Bearing	0.000
Clutch Pressure Plate	0.000
Clutch Release Bearing	0.000
Manual Transmission Shift Anticipate Switch	4.000

Sealers and Lubricants

Application	Description
Clutch Hydraulic Fluid	GM P/N 12345347
Clutch Pedal Bushing Lubricant	GM P/N 1052497

Diagnostic Information and Procedures

Preliminary Checking Procedure

Identify the problem and the probable cause before attempting to repair the following components for any reason other than obvious failure:

- Clutch
- Transmission
- Related hydraulic components

A large percentage of clutch and manual transmission problems include the following conditions:

- High shift effort
- Gear clash
- Grinding

Carefully analyze the problems with the aid of the diagnostic tables.

Before removing what you suspect to be a failed hydraulic clutch system, check the reservoir fluid level with the actuator cylinder in place. Fill the reservoir to the specified level with hydraulic fluid GM P/N 12345347, or equivalent, is preferred over the standard DOT 3 brake fluid. Do not overfill the system.

If the reservoir requires any fluid, check the hydraulic system components for leakage. Remove the rubber boots from the cylinders, checking for leakage past the pistons. A slight wetting of the surface is acceptable. Excessive leakage requires replacement of the system.

Clutch Spin Down Time

1. Apply the park brake.
2. Block the vehicle wheels.
3. Shift the transmission into NEUTRAL.
4. Start the engine and allow the engine to idle.
5. Engage the clutch (release the clutch pedal).
6. Disengage the clutch (depress the clutch pedal): maintain the clutch in the disengaged position for 9 seconds.
7. While still maintaining the clutch in the disengaged position, shift the transmission into reverse.
8. If any grinding noise is produced, refer to *Clutch Does Not Disengage* for further diagnosis.

Clutch Does Not Disengage

Step	Action	Value(s)	Yes	No
DEFINITION: When the pedal is pressed to the floor, the shift control does not move freely in and out of reverse.				
1	Check for a pedal travel restriction. Is there a pedal travel restriction?	—	Go to Step 2	Go to Step 3
2	Remove the pedal travel restriction. Does the clutch work properly?	—	System OK	Go to Step 3
3	Check the clutch system. Refer to <i>Preliminary Checking Procedure</i> . Does the clutch work properly?	—	System OK	Go to Step 4
4	Check for air in the clutch hydraulic system. Is there air in the clutch hydraulic system?	—	Go to Step 6	Go to Step 5
5	Bleed the clutch hydraulic system. Refer to <i>Hydraulic Clutch Bleeding</i> . Does the clutch work properly?	—	System OK	Go to Step 6
6	Check the master cylinder for worn seals. Are the seals worn?	—	Go to Step 7	Go to Step 8
7	Replace the necessary components. Refer to <i>Clutch Master Cylinder Replacement</i> . Does the clutch work properly?	—	System OK	Go to Step 8
8	Check for a worn or damaged actuator cylinder. Is the actuator cylinder worn or damaged?	—	Go to Step 9	Go to Step 10
9	Replace the actuator cylinder or release bearing. Refer to <i>Clutch Actuator Cylinder Replacement</i> or <i>Release Bearing Replacement</i> . Does the clutch work properly?	—	System OK	Go to Step 10
10	Inspect the clutch for the following: • Damaged or worn clutch driven plate • Binding on the clutch driven plate Are the clutch components OK?	—	System OK	Go to Step 11
11	Replace the clutch driven plate. Refer to <i>Clutch Pressure Plate and Clutch Driven Plate (3.8 L)</i> or <i>Clutch Pressure Plate and Clutch Driven Plate (5.7 L)</i> . Does the clutch work properly?	—	System OK	—

Clutch Slipping

Step	Action	Value(s)	Yes	No
DEFINITION: The clutch engages but slips while driving.				
1	Check the clutch disc in order to ensure that it is properly seated in. Is the clutch disc properly seated in?	—	Go to Step 3	Go to Step 2
2	Make 30 to 40 normal starts. Do not overheat the clutch. Does the clutch still slip?	—	Go to Step 3	System OK
3	Check to ensure that the clutch disc is not overheated. Is the clutch disc overheated?	—	Go to Step 4	Go to Step 5
4	Allow the clutch disc to cool. Does the clutch disc still slip?	—	Go to Step 5	System OK
5	Check to see if the clutch disc is oil soaked. Is the clutch disc oil soaked?	—	Go to Step 6	Go to Step 7
6	Correct the leak at the source and replace the clutch disc. Refer to <i>Clutch Pressure Plate and Clutch Driven Plate (3.8 L)</i> or <i>Clutch Pressure Plate and Clutch Driven Plate (5.7 L)</i> . Does the clutch still slip?	—	Go to Step 7	System OK

Clutch Slipping (cont'd)

Step	Action	Value(s)	Yes	No
7	Check the clutch disc for a worn facing or if the facing is torn from the disc plate. Is the facing worn or torn from the disc plate?	—	Go to Step 8	Go to Step 9
8	Replace the clutch disc. Refer to <i>Clutch Pressure Plate and Clutch Driven Plate (3.8 L)</i> or <i>Clutch Pressure Plate and Clutch Driven Plate (5.7 L)</i> . Does the clutch still slip?	—	Go to Step 9	System OK
9	Check for a warped clutch cover on the disc plate or a weak diaphragm spring. Is the disc plate warped or the diaphragm spring weak?	—	Go to Step 10	
10	Replace the necessary components. Refer to <i>Clutch Pressure Plate and Clutch Driven Plate (3.8 L)</i> or <i>Clutch Pressure Plate and Clutch Driven Plate (5.7 L)</i> . Does the clutch still slip?	—		System OK

Clutch Grabbing

Step	Action	Value(s)	Yes	No
DEFINITION: The clutch grabs or chatters during engagement.				
1	Inspect the engine mount fasteners. Are the engine mount fasteners loose?	—	Go to Step 2	Go to Step 3
2	Tighten the engine mount fasteners to the specified torque. Refer to <i>Fastener Tightening Specifications</i> in Engine Mechanical - 3.8L or <i>Fastener Tightening Specifications</i> in Engine Mechanical - 5.7L. Does the clutch still grab?	—	Go to Step 3	System OK
3	Check for a damaged engine mount. Is the engine mount damaged?	—	Go to Step 4	Go to Step 5
4	Replace the engine mount. Refer to <i>Engine Mount Replacement</i> in Engine Mechanical - 3.8L or <i>Engine Mount Replacement (Left), Engine Mount Replacement (Right)</i> in Engine Mechanical - 5.7L. Does the clutch still grab?	—	Go to Step 5	System OK
5	Check the pressure plate for burned or smeared resin. Is there burned or smeared resin on the pressure plate?	—	Go to Step 6	Go to Step 7
6	- If the burns or smears are superficial, clean or sand off the excess resin. - If the pressure plate is burned or has heat checked parts, then replace the pressure plate. Refer to <i>Clutch Pressure Plate and Clutch Driven Plate (3.8 L)</i> or <i>Clutch Pressure Plate and Clutch Driven Plate (5.7 L)</i>. Does the clutch still grab?	—	Go to Step 7	System OK
7	Check for a warped pressure plate. Is the pressure plate warped?	—	Go to Step 8	Go to Step 9
8	Replace the pressure plate. Ensure that the runout does not exceed the amount given in the value column. Refer to <i>Clutch Pressure Plate and Clutch Driven Plate (3.8 L)</i> or <i>Clutch Pressure Plate and Clutch Driven Plate (5.7 L)</i> . Does the clutch still grab?	1.25 mm (0.050 in)	Go to Step 9	System OK
9	Check for oil on the clutch pressure plate facing or a burned or glazed facing. Is there oil on the clutch pressure plate facing or a burned or glazed face?	—	Go to Step 10	Go to Step 11

Clutch Grabbing (cont'd)

Step	Action	Value(s)	Yes	No
10	1. Correct the leak at the source. Refer <i>Oil Leak Diagnosis</i> in Engine Mechanical. 2. Install a new clutch pressure plate. Refer to <i>Clutch Pressure Plate and Clutch Driven Plate (3.8 L)</i> or <i>Clutch Pressure Plate and Clutch Driven Plate (5.7 L)</i> . Does the clutch still grab?	—	Go to Step 11	System OK
11	Check for worn splines on the transmission main drive gear. Are there worn splines on the transmission main drive gear?	—	Go to Step 12	Go to Step 13
12	Replace the transmission. Refer to <i>Transmission Replacement</i> in Manual Transmission - M49 or <i>Transmission Replacement</i> in Manual Transmission - MM6. Does the clutch still grab?	—	Go to Step 13	System OK
13	Inspect the release bearing at the transmission main drive gear. Is the release bearing binding on the retaining tube on the transmission main drive gear?	—	Go to Step 14	—
14	Replace the release bearing. Refer to <i>Release Bearing Replacement</i> . Does the clutch still grab?	—	—	System OK

Clutch Rattle (Trans Click)

Step	Action	Value(s)	Yes	No
DEFINITION: A rattling or clicking noise is coming from the clutch or the transmission.				
1	Check the transmission for noise. Is the transmission OK?	—	—	Go to Step 2
2	Remove the clutch disc and check for the following conditions: - Damaged or weak disc plate springs - Weak diaphragm spring Is the diaphragm spring weak or are the springs damaged? Refer to <i>Clutch Pressure Plate and Clutch Driven Plate (3.8 L)</i> or <i>Clutch Pressure Plate and Clutch Driven Plate (5.7 L)</i> .	—	—	Go to Step 3
3	Replace the necessary components. Is the clutch system OK?	—	System OK	—

Release Bearing Noisy with Clutch Engaged

Step	Action	Value(s)	Yes	No
DEFINITION: The clutch release bearing is noisy with the clutch fully engaged or during engagement.				
1	Inspect the release bearing in the actuator cylinder. Is the release bearing worn?	—	Go to Step 2	Go to Step 3
2	Replace the release bearing in the actuator. Refer to <i>Release Bearing Replacement</i> . Is the clutch release bearing still noisy?	—	—	System OK
3	Check the clutch release bearing or binding on the transmission bearing retainer. Is the release bearing binding on the transmission bearing retainer?	—	Go to Step 4	—
4	Clean and lubricate the affected area. Is the affected area clean and lubricated?	—	System OK	—

Clutch Noisy During Engagement

Step	Action	Value(s)	Yes	No
DEFINITION: The clutch is noisy with the clutch fully engaged.				
1	Check for a worn release bearing on the actuator cylinder. Is the release bearing worn?	—	Go to Step 2	Go to Step 3
2	Replace the release bearing. Refer to <i>Release Bearing Replacement</i> . Is the clutch noisy?	—	—	System OK
3	Check for a loose clutch pilot bearing. Is the pilot bearing loose?	—	Go to Step 4	—
4	Replace the clutch pilot bearing. Refer to <i>Pilot Bearing Replacement</i> . Is the clutch noisy?	—	—	System OK

Pedal Stays on Floor (Clutch Disengaged)

Step	Action	Value(s)	Yes	No
DEFINITION: The clutch pedal stays on the floor (clutch disengaged), or extremely low pedal.				
1	Inspect the clutch hydraulic line. Is the hydraulic line leaking or damaged?	—	Go to Step 2	Go to Step 3
2	Replace the master cylinder and hydraulic line. Refer to <i>Clutch Master Cylinder Replacement</i> . Does the clutch pedal still stay on the floor when disengaged?	—	Go to Step 3	System OK
3	Inspect the reservoir for fluid. Is there fluid in the reservoir?	—	Go to Step 5	Go to Step 4
4	Fill the reservoir with fluid. Does the clutch pedal still stay on the floor when disengaged?	—	Go to Step 5	System OK
5	Inspect the clutch release bearing on the actuator for binding. Is there binding on the clutch release bearing?	—	Go to Step 6	Go to Step 7
6	Lubricate and free up the clutch release bearing or replace the clutch release bearing. Refer to <i>Release Bearing Replacement</i> . Does the clutch pedal still stay on the floor when disengaged?	—	Go to Step 7	System OK
7	Check to see if the master cylinder pushrod has fallen off the clutch pedal. Has the master cylinder pushrod fallen off the clutch pedal?	—	Go to Step 8	Go to Step 9
8	Correctly install the master cylinder pushrod. Refer to <i>Clutch Master Cylinder Replacement</i> . Does the clutch pedal still stay on the floor when disengaged?	—	Go to Step 9	System OK
9	Inspect the master cylinder. Is the master cylinder faulty?	—	Go to Step 10	Go to Step 11
10	Replace the clutch master cylinder as needed. Refer to <i>Clutch Master Cylinder Replacement</i> . Does the clutch pedal still stay on the floor when disengaged?	—	Go to Step 11	System OK
11	Inspect the clutch diaphragm spring. Is the diaphragm spring weak or broken?	—	Go to Step 12	Go to Step 13
12	Replace the clutch pressure plate. Refer to <i>Clutch Pressure Plate and Clutch Driven Plate (3.8 L) or Clutch Pressure Plate and Clutch Driven Plate (5.7 L)</i> . Does the clutch pedal still stay on the floor when disengaged?	—	Go to Step 13	System OK

Pedal Stays on Floor (Clutch Disengaged) (cont'd)

Step	Action	Value(s)	Yes	No
13	Check the master cylinder seal and the master cylinder center valve seal. Is the master cylinder seal or the center valve seal faulty?	—	Go to Step 14	System OK
14	Replace the master cylinder. Refer to <i>Clutch Master Cylinder Replacement</i> . Does the clutch still stay on the floor when disengaged?	—	—	System OK

Clutch Pedal Hard to Push

Step	Action	Value(s)	Yes	No
DEFINITION: Clutch pedal requires excessive pressure to apply.				
1	Check the clutch pedal to ensure that it is properly lubricated. Does the clutch pedal need lubricating?	—	Go to Step 2	Go to Step 3
2	Lubricate the clutch pedal. Is the pedal still hard to press?	—	Go to Step 3	System OK
3	Inspect the clutch hydraulic line for blockage or crimping. Is the hydraulic line blocked or crimped?	—	Go to Step 4	Go to Step 5
4	Replace the clutch hydraulic line and master cylinder. Refer to <i>Clutch Master Cylinder Replacement</i> . Is the pedal still hard to push?	—	Go to Step 5	System OK
5	Check the actuator cylinder for binding. Is the actuator cylinder binding?	—	Go to Step 6	Go to Step 7
6	Replace the actuator cylinder or release bearing. Refer to <i>Clutch Actuator Cylinder Replacement</i> or <i>Release Bearing Replacement</i> . Is the pedal still hard to push?	—	Go to Step 7	System OK
7	Inspect the clutch master cylinder for binding. Is the clutch master cylinder binding?	—	Go to Step 8	Go to Step 9
8	Replace the master cylinder. Refer to <i>Clutch Master Cylinder Replacement</i> . Is the pedal still hard to push?	—	Go to Step 9	System OK
9	Inspect the clutch driven plate for wear. Is the clutch driven plate worn?	—	Go to Step 10	System OK
10	Replace the clutch driven plate. Refer to <i>Clutch Pressure Plate and Clutch Driven Plate (3.8 L)</i> or <i>Clutch Pressure Plate and Clutch Driven Plate (5.7 L)</i> . Is the pedal still hard to push?	—	—	System OK

Clutch Actuator Fluid Leaks

Step	Action	Value(s)	Yes	No
DEFINITION: Hydraulic fluid is in the actuator cylinder area or on the cylinder body.				
1	Check the actuator cylinder for hydraulic fluid leaks. Is there a leak on the actuator cylinder?	—	Go to Step 2	System OK
2	Replace the actuator cylinder. Refer to <i>Clutch Actuator Cylinder Replacement</i> . Is the clutch system OK?	—	—	System OK

Clutch Pedal Travels to Floor (Fluid in Master Cyl)

Step	Action	Value	Yes	No
DEFINITION: The clutch pedal travels to the floor with no pressure and very little resistance.				
1	Check the fluid level in the clutch master cylinder reservoir. Is the fluid level OK?	—	Go to Step 3	Go to Step 2
2	Fill the master cylinder reservoir to the required level. Is the clutch system OK?	—	System OK	Go to Step 3
3	Check for a burst or a leaking hydraulic line. Is the hydraulic line OK?	—	Go to Step 5	Go to Step 4
4	Replace the clutch hydraulic line and master cylinder. Refer to <i>Clutch Master Cylinder Replacement</i> . Is the clutch system OK?	—	System OK	Go to Step 5
5	Check for hydraulic fluid in the master cylinder dust cover area. Is there fluid in the dust cover?	—	Go to Step 6	Go to Step 7
6	Replace the clutch hydraulic line and master cylinder. Refer to <i>Clutch Master Cylinder Replacement</i> . Is the clutch system OK?	—	System OK	Go to Step 7
7	Check for a rising hydraulic fluid level in the master cylinder reservoir. Does the fluid level rise when the clutch pedal is depressed?	—	Go to Step 9	Go to Step 8
8	Replace the clutch master cylinder. Refer to <i>Clutch Master Cylinder Replacement</i> . Is the clutch system OK?	—	System OK	Go to Step 9
9	Inspect the clutch master cylinder. Is the clutch master cylinder faulty?	—	Go to Step 10	Go to Step 11
10	Replace the clutch master cylinder. Refer to <i>Clutch Actuator Cylinder Replacement</i> . Is the clutch system OK?	—	System OK	Go to Step 11
11	Inspect the actuator cylinder. Is the concentric slave cylinder faulty?	—	Go to Step 12	—
12	Replace the actuator cylinder. Refer to <i>Clutch Actuator Cylinder Replacement</i> . Is the clutch system OK?	—	System OK	—

Clutch Master Cylinder Fluid Leaks

Step	Action	Value	Yes	No
DEFINITION: Hydraulic fluid is present in the master cylinder dust cover and on the clutch pedal.				
1	Inspect the master cylinder seal for any hydraulic fluid leaks. Does the clutch master cylinder seal have any leaks?	—	Go to Step 2	—
2	Replace the clutch master cylinder. Refer to <i>Clutch Master Cylinder Replacement</i> . Is the clutch system OK?	—	System OK	—

Clutch Actuator Fluid Leaks

Step	Action	Value	Yes	No
DEFINITION: Hydraulic fluid is in the actuator cylinder area or on the cylinder body.				
1	Check the actuator cylinder for hydraulic fluid leaks. Is there a leak on the actuator cylinder?	—	Go to Step 2	—
2	Replace the actuator cylinder. Refer to <i>Clutch Actuator Cylinder Replacement</i> . Is the clutch system OK?	—	System OK	—

Clutch Pedal Spongy

Step	Action	Value(s)	Yes	No
DEFINITION: The clutch pedal feels spongy when depressed.				
1	Check the fluid level in the master cylinder reservoir. Is the fluid level OK?	—	Go to Step 3	Go to Step 2
2	Fill the reservoir with clean hydraulic clutch fluid. Is the reservoir properly filled?	—	Go to Step 3	Go to Step 2
3	Bleed the clutch hydraulic system. Refer to <i>Hydraulic Clutch Bleeding</i> . Does the clutch system work?	—	System OK	Go to Step 4
4	Inspect the clutch master cylinder. Is the master cylinder faulty?	—	Go to Step 5	Go to Step 6
5	Replace the clutch master cylinder. Refer to <i>Clutch Master Cylinder Replacement</i> . Does the clutch system work?	—	System OK	Go to Step 6
6	Inspect the actuator cylinder. Is the actuator cylinder faulty?	—	Go to Step 7	—
7	Replace the actuator cylinder. Refer to <i>Clutch Actuator Cylinder Replacement</i> . Does the clutch system work?	—	System OK	—

Unable To Select Gears

Step	Action	Value	Yes	No
DEFINITION: Clutch pedal effort and clutch pedal travel are normal.				
1	Inspect the clutch system. Refer to <i>Preliminary Checking Procedure</i> . Is the clutch system OK?	—	System OK	Go to Step 2
2	Diagnose the transmission. Refer to <i>Transmission Replacement</i> in Engine Mechanical - 3.8L or <i>Transmission Replacement</i> in Engine Mechanical - 5.7L. Does the clutch system operate properly?	—	System OK	Go to Step 3
3	Check the master cylinder. Is the master cylinder worn or faulty?	—	Go to Step 4	Go to Step 5
4	Replace the clutch master cylinder. Refer to <i>Clutch Master Cylinder Replacement</i> . Does the clutch work now?	—	System OK	Go to Step 5
5	Inspect the actuator cylinder. Is the concentric slave cylinder worn or faulty?	—	Go to Step 6	—
6	Replace the actuator cylinder. Refer to <i>Clutch Actuator Cylinder Replacement</i> . Does the clutch work now?	—	System OK	—

Clutch Pedal Sticks or Binds

Step	Action	Value(s)	Yes	No
DEFINITION: The clutch pedal sticks or binds during clutch pedal travel.				
1	Check the clutch pedal bushings for wear. Are the clutch pedal bushings worn?	—	Go to Step 2	Go to Step 3
2	Replace the clutch pedal bushings. Refer to <i>Clutch Pedal Replacement</i> . Does the clutch work properly?	—	System OK	Go to Step 3
3	Check the clutch release bearing. Is the release bearing faulty?	—	Go to Step 4	—
4	Replace the clutch release bearing. Refer to <i>Release Bearing Replacement</i> . Does the clutch system work properly?	—	System OK	—

Squeaky Clutch Pedal

Step	Action	Value(s)	Yes	No
DEFINITION: The clutch pedal squeaks when depressed or released.				
1	Check for DOT 3 brake fluid in the clutch hydraulic system. Is there DOT 3 brake fluid in the system?	—	Go to Step 2	Go to Step 3
2	1. Drain the clutch hydraulic system. 2. Refill the system with clutch hydraulic fluid (GM P/N 12345347 or equivalent). 3. Bleed the hydraulic system. Refer to <i>Hydraulic Clutch Bleeding</i> . Does the clutch pedal still squeak?	—	Go to Step 3	System OK
3	Check for dry clutch pedal bushings. Are the bushings dry?	—	Go to Step 4	Go to Step 5
4	Lubricate the bushings using GM P/N 1052497 or equivalent. Does the clutch pedal still squeak?	—		System OK
5	Check for worn clutch pedal bushings. Are the clutch pedal bushings worn?	—	Go to Step 6	—
6	Replace the clutch pedal bushings. Refer to <i>Clutch Pressure Plate and Clutch Driven Plate (3.8 L)</i> or <i>Clutch Pressure Plate and Clutch Driven Plate (5.7 L)</i> . Does the clutch pedal still squeak?	—	—	System OK

Rapid Driven Plate Wear

Step	Action	Value(s)	Yes	No
DEFINITION: Rapid or excessive wear of the clutch driven plate.				
1	Inspect the clutch pressure plate diaphragm spring. Is the diaphragm spring weak?	—	Go to Step 2	Go to Step 3
2	Replace the clutch pressure plate. Refer to <i>Clutch Pressure Plate and Clutch Driven Plate (3.8 L)</i> or <i>Clutch Pressure Plate and Clutch Driven Plate (5.7 L)</i> . Does the clutch still slip?	—	Go to Step 3	System OK
3	Inspect the engine flywheel and/or clutch pressure plate. Is the engine flywheel and/or pressure plate scored?	—	Go to Step 4	Go to Step 7
4	Check the engine flywheel and/or pressure plate for scoring. Is the scoring superficial?	—	Go to Step 5	Go to Step 6
5	Grind the engine flywheel and/or pressure plate. Does the clutch still slip?	—	System OK	—
6	Replace the engine flywheel and or pressure plate. Refer to • <i>Engine Flywheel Replacement in Engine Mechanical - 3.8L.</i> • <i>Engine Flywheel Replacement in Engine Mechanical - 5.7L.</i> • <i>Clutch Pressure Plate and Clutch Driven Plate (3.8 L)</i> • <i>Clutch Pressure Plate and Clutch Driven Plate (5.7 L)</i> Does the clutch still slip?	—	—	System OK
7	Discuss with vehicle owner possibility of improper driving habits such as: • Riding the clutch. • Racing the engine and slipping the clutch excessively during hard starting. • Holding the vehicle in position on inclines by slipping the clutch. Was there discussion with vehicle owner?	—	System OK	—

Repair Instructions

Hydraulic Clutch Bleeding

Notice: DO NOT use fluid which has been bled from a hydraulic clutch system, in order to fill the clutch master cylinder reservoir; due to the possibility that the fluid may be aerated, have too much moisture content or be contaminated and may cause system or vehicle damage.

1. Ensure the reservoir is filled to the fill line with new hydraulic clutch fluid. Add fluid if required. Use GM P/N 12345347 or equivalent.
2. Press the clutch pedal all the way down to the floor.
3. Open the bleeder on the actuator cylinder to purge the air.
4. Close the bleeder and release the clutch pedal.

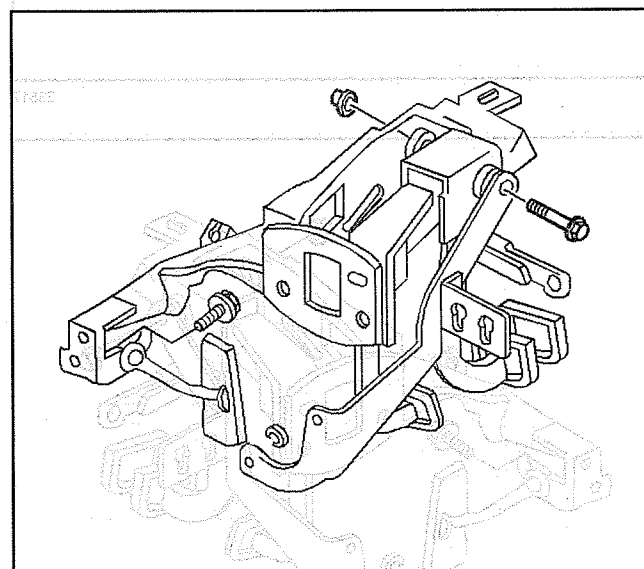
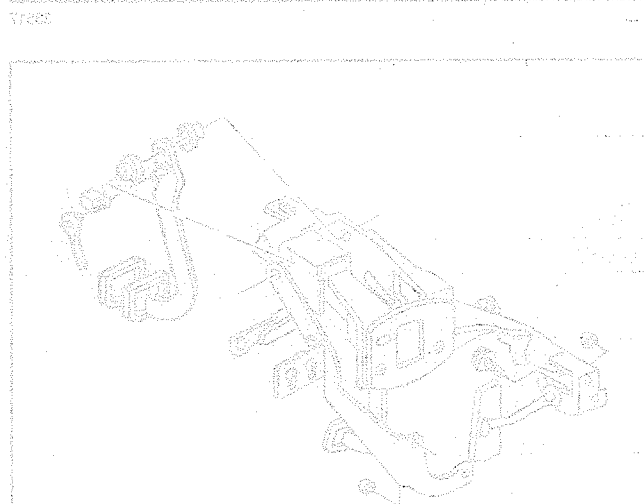
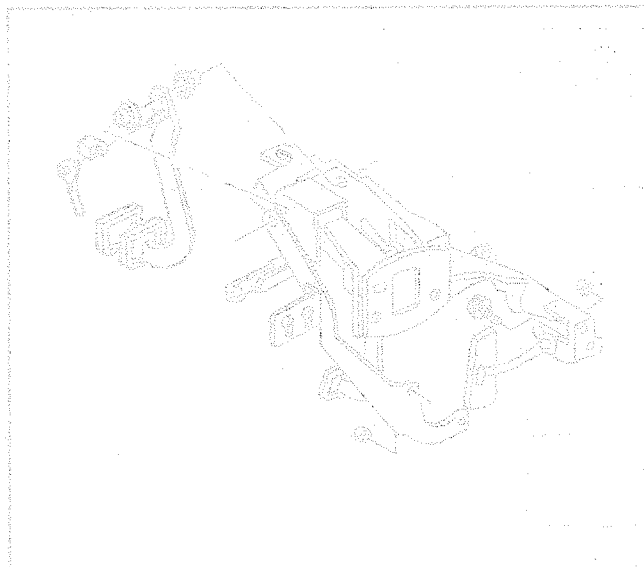
Important: Ensure no air is drawn into the clutch system.

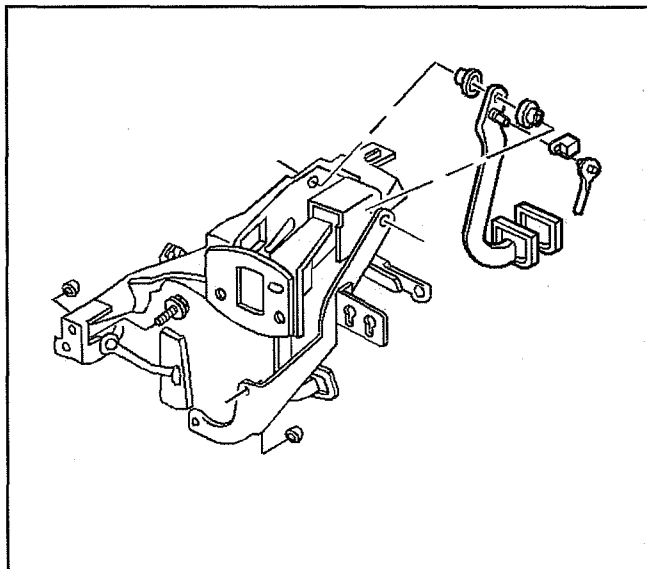
5. Repeat steps 2, 3 and 4 until all air is out of the clutch system.
 - 5.1. Check and refill the reservoir as needed while bleeding.
 - 5.2. After bleeding, pump the clutch pedal several times. If the clutch engagement is not satisfactory, repeat the bleed procedure.
6. If the previous procedures are unsuccessful, perform the following steps.
 - 6.1. Pump the clutch pedal very fast for 30 seconds.
 - 6.2. Stop pumping and let the air escape into the reservoir.
 - 6.3. Repeat this procedure as necessary.

Clutch Pedal Replacement

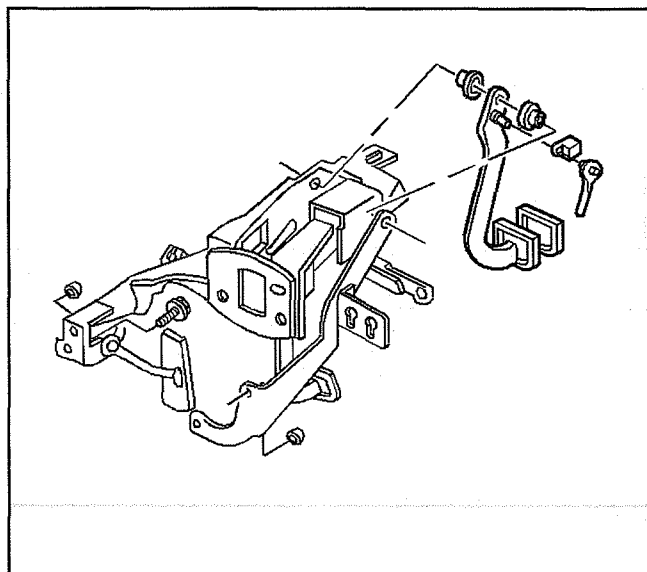
Removal Procedure

1. Remove the brake and accelerator and clutch pedal with the bracket. Refer to *Brake Pedal Replacement* in Hydraulic Brakes.
2. Remove the brake pedal pivot nut.
3. Remove the brake pedal pivot bolt.

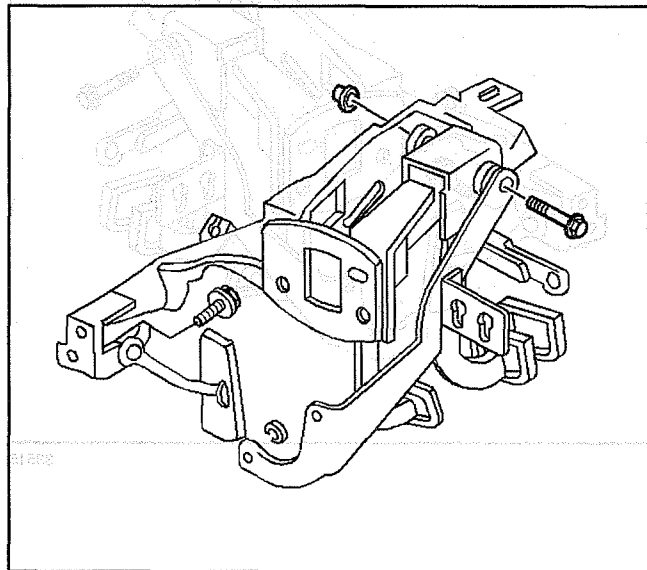




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4. Remove the clutch pedal with the pivot bushings.

Hydraulic Clutch Bleeding

Notes: DO NOT use fluid which has been bled from a hydraulic clutch system, in order to fill the clutch master cylinder reservoir, due to the possibility that air fluid may be aerated, have too much moisture content or be contaminated and may cause system or vehicle damage.

1. Ensure the reservoir is filled to the fill line with new hydraulic clutch fluid. Add fluid if required. Use GM P/N 12042347 or equivalent.
2. Press the clutch pedal all the way down to the floor.
3. Open the bleeder on the actuator cylinder to purge the air.
4. Close the bleeder and release the clutch pedal.

Important: Ensure no air is drawn into the clutch system.

Installation Procedure

1. Install the clutch pedal with the pivot bushings.

- 2.1. Check and fill the reservoir as needed while bleeding.
- 2.2. After bleeding, pump the clutch pedal several times. If the clutch engagement is not satisfactory, repeat the bleed procedure.
- 2.3. If the previous procedures are unsuccessful, perform the following steps:
 - 2.3.1. Pump the clutch pedal very fast for 30 seconds.
 - 2.3.2. Stop pumping and let the air escape into the reservoir.
 - 2.3.3. Repeat this procedure as necessary.

Clutch Pedal Replacement

Removal Procedure

1. Remove the brake and accelerator and clutch

Notice: Refer to *Fastener Notice* in Cautions and Notices.

2. Install the brake pedal pivot nut and bolt.

Tighten

Tighten the brake pedal pivot nut to 54 N·m (40 lb ft).

3. Install the brake and accelerator and clutch pedal with the bracket. Refer to *Brake Pedal Replacement* in Hydraulic Brakes.

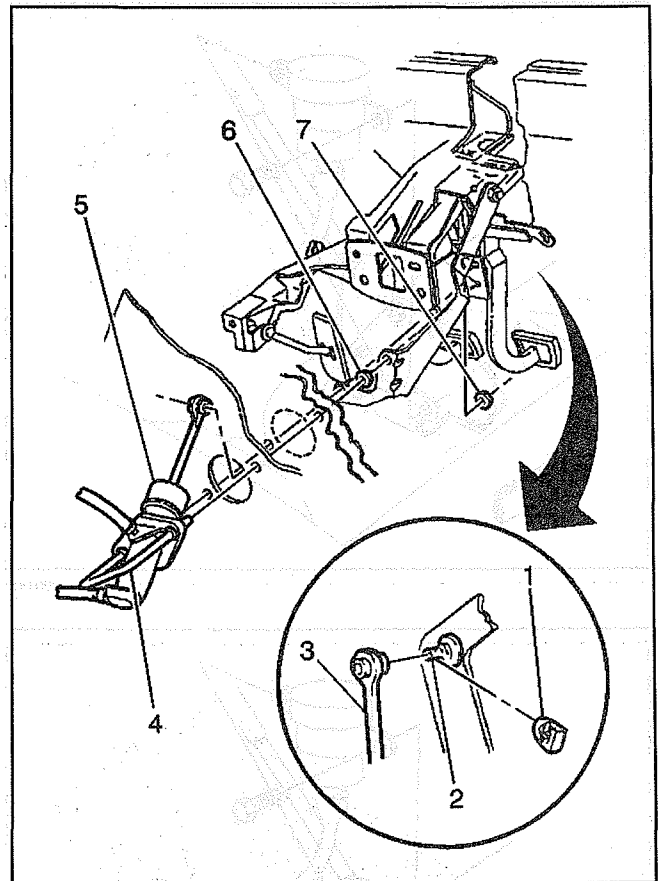
Clutch Master Cylinder Replacement

Removal Procedure

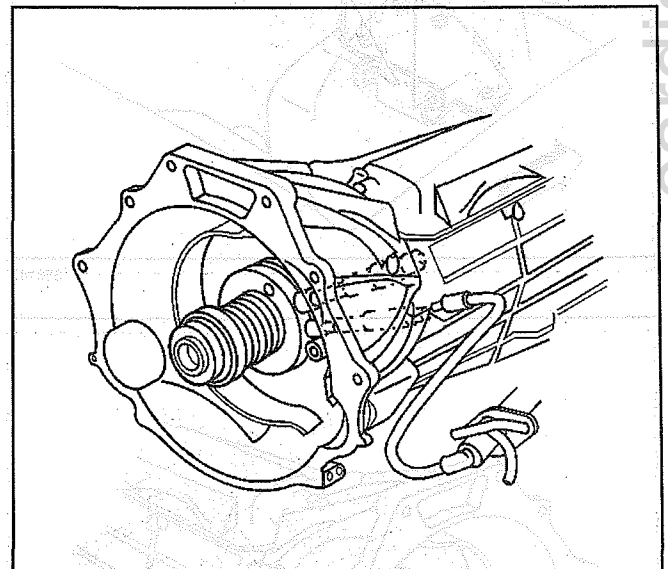
Tools Required

J 36221 Hydraulic Clutch Line Separator

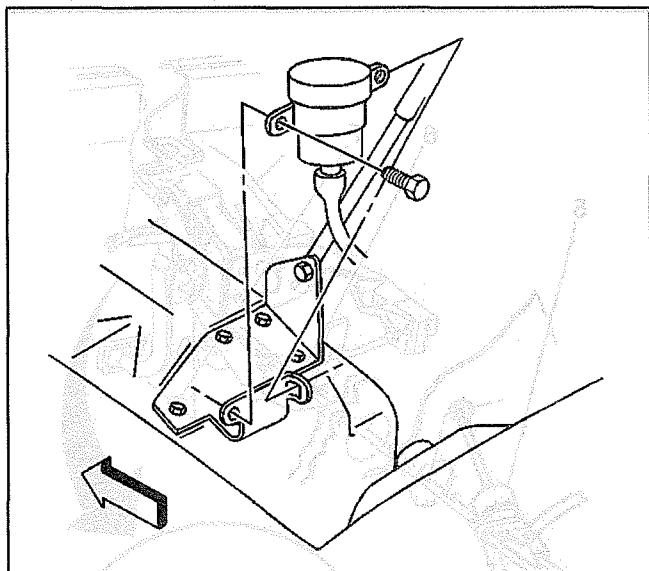
1. Remove the driver side instrument panel insulator. Refer to *Closeout/Insulator Panel Replacement - Left* in Instrument Panel, Gauges and Console.
2. Remove the drive side knee bolster. Refer to *Knee Bolster Replacement - Left* in Instrument Panel, Gauges and Console.
3. Remove the clutch pedal pin retainer (1).
4. Remove the clutch master cylinder push rod (3) from the clutch pedal pin (2).
5. Remove the clutch master cylinder nuts (7).
6. Remove the clutch master cylinder push on nuts (6).
7. Remove the clutch master cylinder U-bolt (4).
8. Remove the clutch master cylinder (5) from the front of dash.
9. Raise and suitably support the vehicle. Refer to *Lifting and Jacking the Vehicle* in General Information.
10. Lower the vehicle.
11. Using the J 36221, depress the white circular release ring on the actuator hose and simultaneously pull lightly on the master cylinder hose to disconnect.
12. Protect both hose coupling ends from dirt and damage.
13. Lower the vehicle.



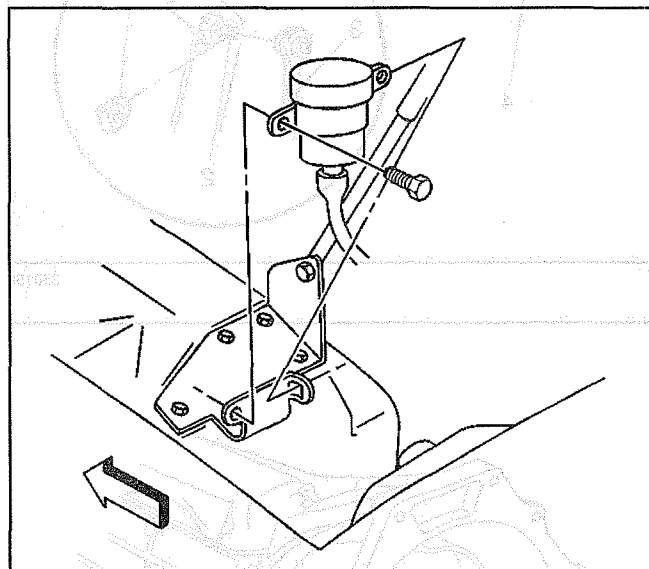
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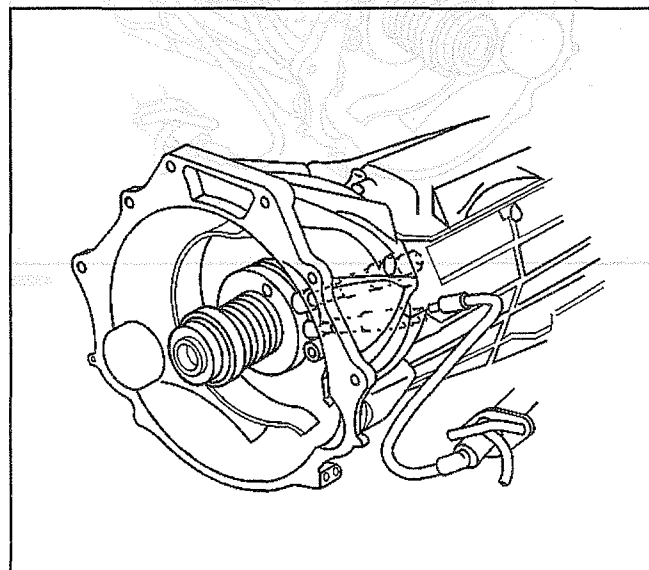
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14. Remove the clutch master cylinder reservoir push-in retainer.
15. Slide the clutch master cylinder reservoir out from the hood strut bracket.
16. Remove the clutch master cylinder (and reservoir) from the vehicle.

Installation Procedure

1. Install the clutch master cylinder into the opening in the front of dash.
2. Slide the clutch master cylinder reservoir into the opening on the hood strut bracket.
3. Install the clutch master cylinder reservoir push-in retainer.

4. Raise the vehicle.

Important: DO NOT rely on an audible click or a visual verification of the clutch hydraulic hose quick connect fitting connection.

5. Connect the clutch master cylinder hose to the clutch actuator.
Push together the clutch hydraulic quick connect fittings, then pull back on the fittings to verify engagement.
6. Check the clutch hydraulic hoses for twists or kinks.
7. Lower the vehicle.

8. Install the clutch master cylinder U-bolt (4).
9. Install the clutch master cylinder push on nuts (6).

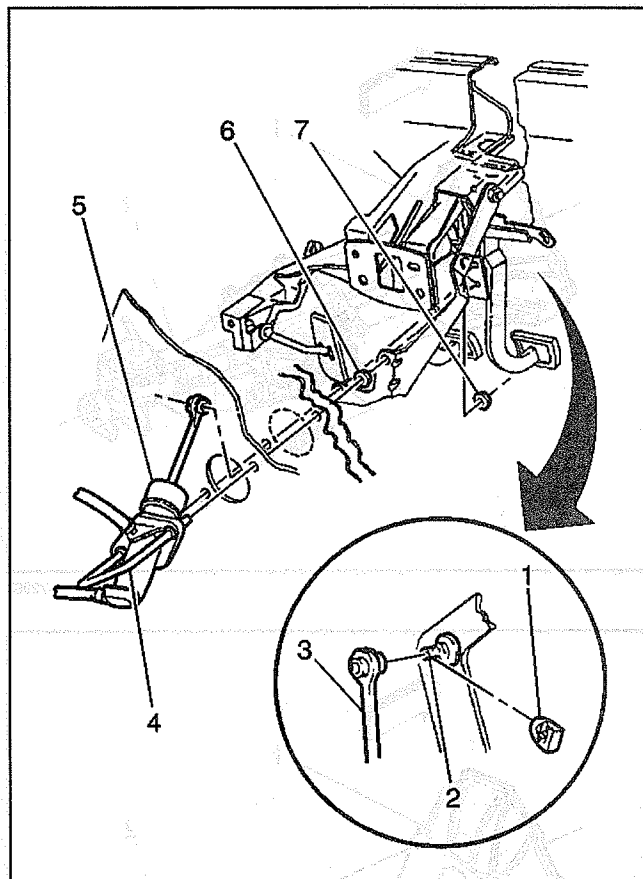
Notice: Refer to *Fastener Notice* in Cautions and Notices.

10. Install the clutch master cylinder nuts (7).

Tighten

Tighten the clutch master cylinder nuts (7) to 20 N·m (15 lb ft).

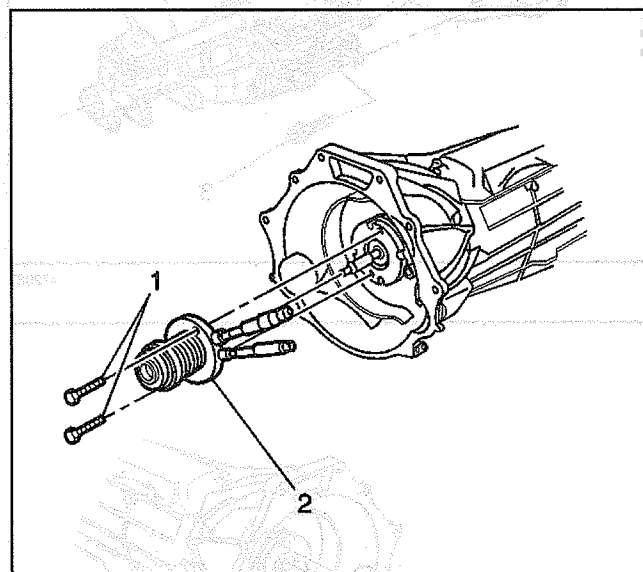
11. Install the clutch master cylinder push rod (3) onto the clutch pedal pin (2).
12. Install the clutch pedal pin retainer (1).
13. Remove the drive side knee bolster. Refer to *Knee Bolster Replacement - Left* in Instrument Panel, Gauges and Console.
14. Remove the driver side instrument panel insulator. Refer to *Closeout/Insulator Panel Replacement - Left* in Instrument Panel, Gauges and Console.
15. Bleed the clutch hydraulic system. Refer to *Hydraulic Clutch Bleeding*.



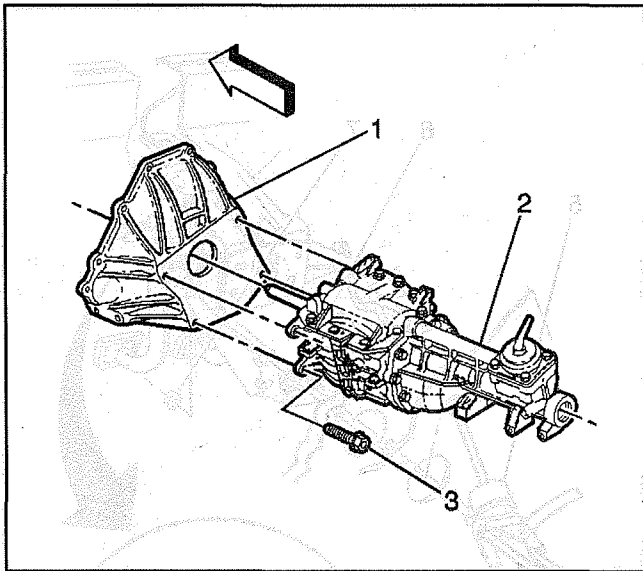
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Clutch Actuator Cylinder Replacement

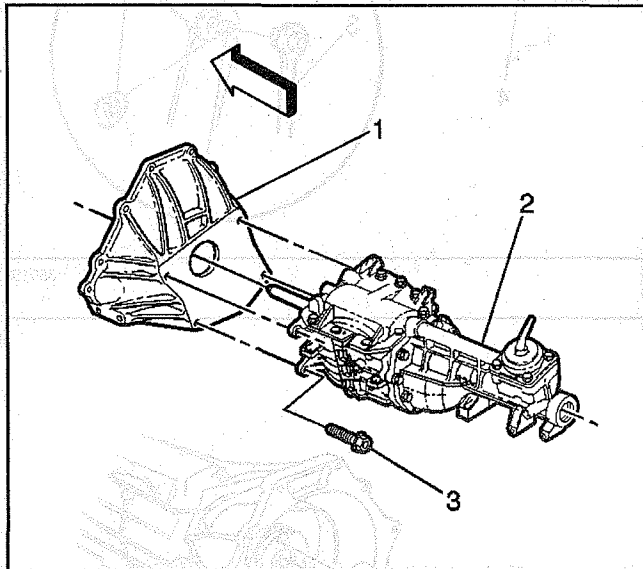
1. Remove the manual transmission from the vehicle. Refer to *Transmission Replacement* in Manual Transmission - M49 or *Transmission Replacement* in Manual Transmission - MM6.
2. Remove the clutch actuator cylinder bolts (1).



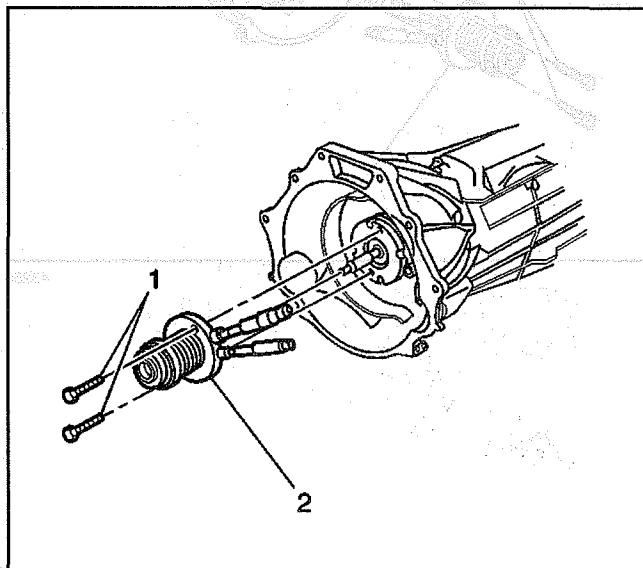
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3. Remove the transmission bolts (3).
4. Separate the flywheel/clutch housing (1) from the transmission (2).
5. Remove the flywheel/clutch housing (1) and clutch actuator cylinder from the transmission (2).

10. Install the clutch actuator cylinder (2) to the transmission (3).
 Tighten the clutch actuator cylinder nuts (7) to 20 N·m (15 lb ft).
 11. Install the clutch master cylinder push rod (3) onto the clutch pedal pin (5).
 12. Install the clutch pedal pin retainer (7).
 13. Remove the drive side knee bolster. Refer to Knee Bolster Replacement - Left in Instrument Panel, Gauges and Console.
 14. Remove the driver side instrument panel insulation. Refer to Closeout/Insulator Panel Replacement - Left in Instrument Panel, Gauges and Console.
 15. Bleed the clutch hydraulic system. Refer to Hydraulic Clutch Bleeding.

Installation Procedure

1. Install the flywheel/clutch housing (1) and clutch actuator cylinder to the transmission (2).

Notice: Refer to *Fastener Notice* in Cautions and Notices.

2. Install the transmission bolts (3).

Tighten

- Tighten the 5-speed transmission bolts (3) to 75 N·m (55 lb ft).
- Tighten the 6-speed transmission bolts to 50 N·m (37 lb ft).

3. Install the clutch actuator cylinder bolts (1).

Tighten

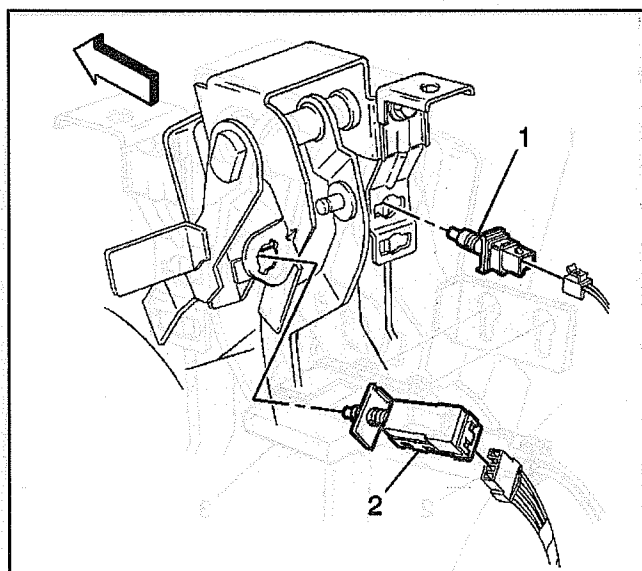
Tighten the clutch actuator cylinder bolts (1) to 8 N·m (71 lb in).

4. Install the manual transmission to the vehicle. Refer to *Transmission Replacement* in Manual Transmission - M49 or *Transmission Replacement* in Manual Transmission - MM6.

Clutch Anticipate Switch Replacement

Removal Procedure

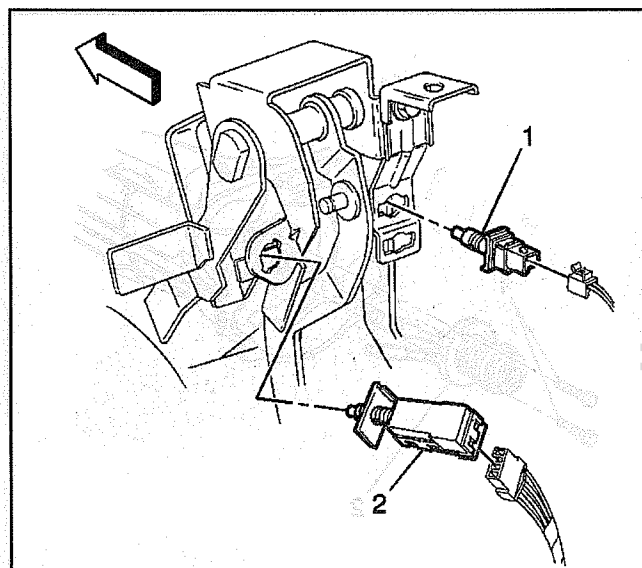
1. Remove the instrument panel driver knee bolster. Refer to *Knee Bolster Replacement - Left* in Instrument Panel, Gauges and Console.
2. Disconnect the clutch anticipate switch harness electrical connector from the clutch anticipate switch (2).
3. Remove the clutch anticipate switch (2) from the pedal bracket assembly.



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Installation Procedure

1. Install the clutch anticipate switch (2) to the pedal bracket assembly until fully seated. With the clutch pedal maintained in its fully rearward position, push the switch through its retainer until the switch barrel is touching the pedal target and the switch plunger is fully depressed.
2. Connect the clutch anticipate switch electrical connector to the clutch anticipate switch (2).
3. Install the instrument panel driver knee bolster. Refer to *Knee Bolster Replacement - Left* in Instrument Panel, Gauges and Console.

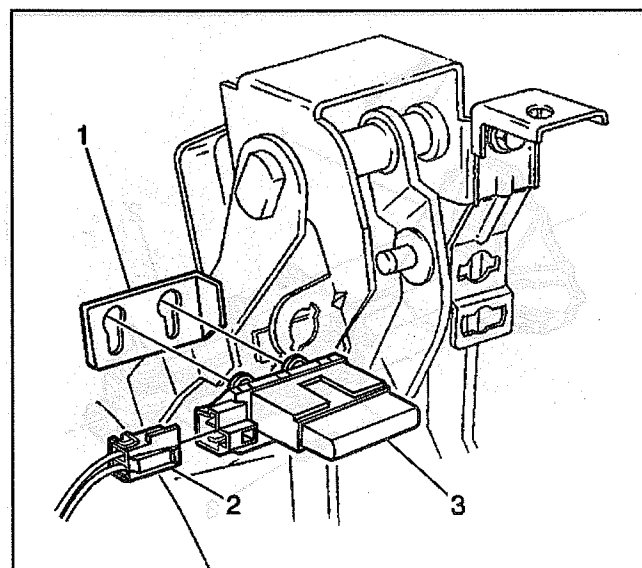


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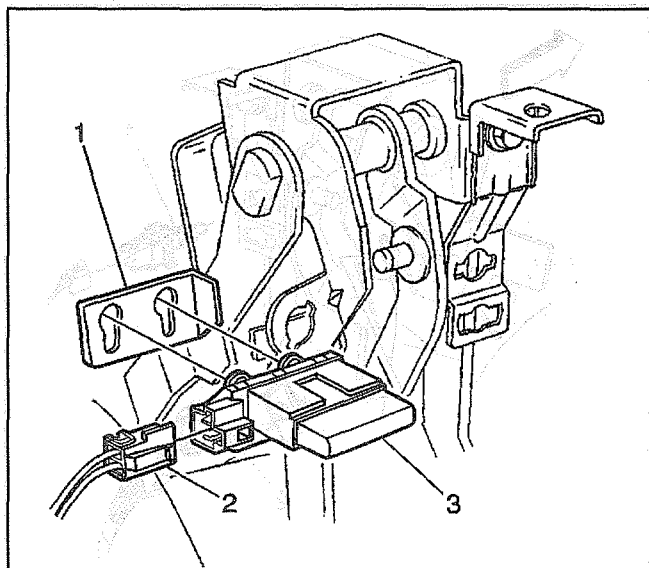
Clutch Pedal Position Switch Replacement

Removal Procedure

1. Remove the instrument panel driver knee bolster. Refer to *Knee Bolster Replacement - Left* in Instrument Panel, Gauges and Console.
2. Disconnect the clutch pedal position switch electrical connector (2).
3. Pull up to disengage the clutch pedal position switch (3) from the pedal bracket (1).
4. Remove the clutch pedal position switch (3).



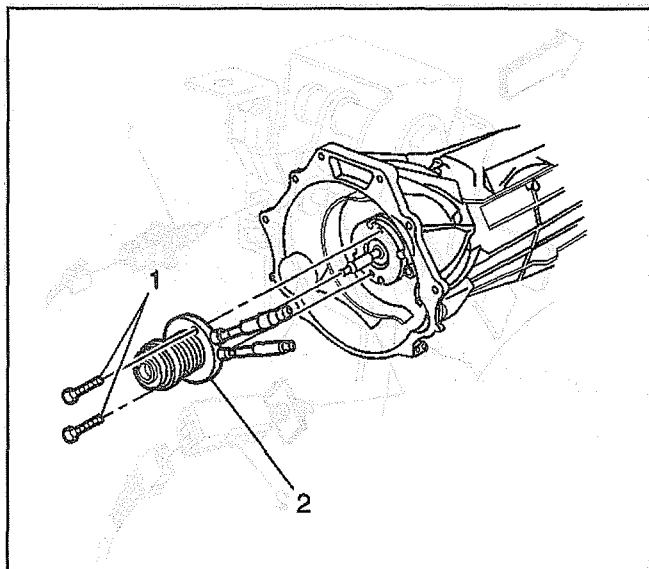
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Installation Procedure

1. Install the clutch pedal position switch (3).
2. Align the buttons on the clutch pedal position switch (3) to the slotted holes on the bracket (1).
3. Press the clutch pedal position switch (3) down until secure.
4. Connect the clutch pedal position switch electrical connector (2).
5. Install the instrument panel driver knee bolster. Refer to *Knee Bolster Replacement - Left* in Instrument Panel, Gauges and Console.

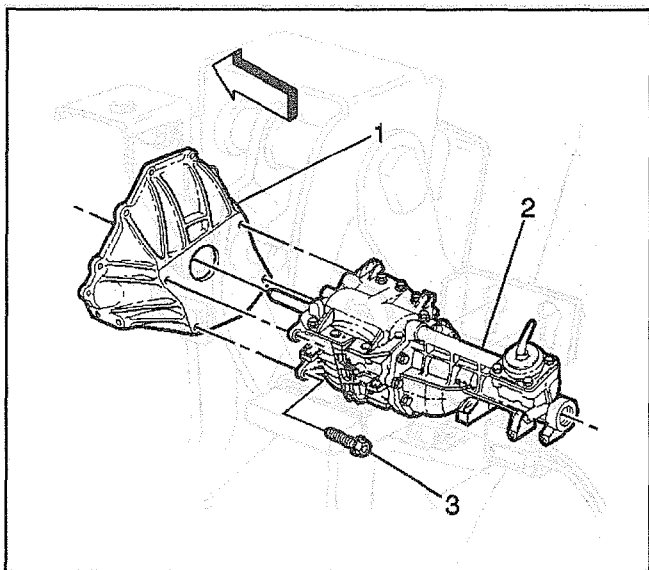


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Clutch Housing Replacement

Removal Procedure

1. Remove the manual transmission. Refer to *Transmission Replacement* in Manual Transmission - M49 or *Transmission Replacement* in Manual Transmission - MM6.
2. Remove the clutch actuator cylinder bolts (1).



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3. Remove the transmission bolts (3).
4. Separate the flywheel/clutch housing (1) from the transmission (2).
Remove the flywheel/clutch housing (1) and clutch actuator cylinder from the transmission (2).

Installation Procedure

1. Install the flywheel/clutch housing (1) and clutch actuator cylinder to the transmission (2).

Notice: Refer to *Fastener Notice* in Cautions and Notices.

2. Install the transmission bolts (3).

Tighten

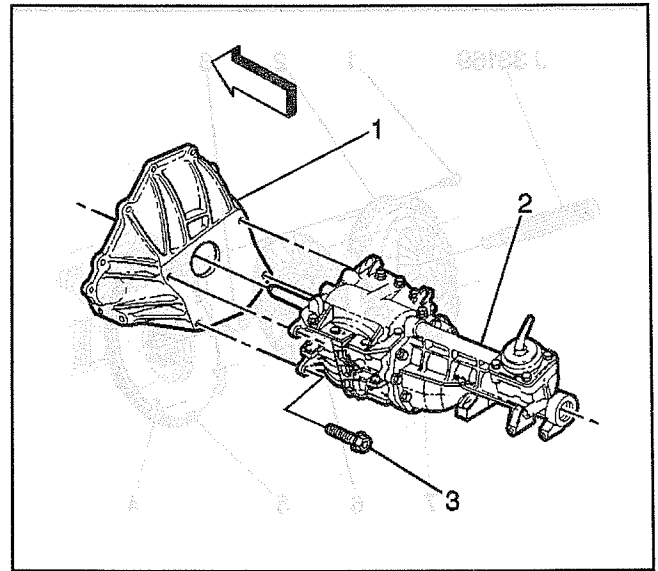
- Tighten the 5-speed transmission bolts (3) to 75 N·m (55 lb ft).
- Tighten the 6-speed transmission bolts to 50 N·m (37 lb ft).

3. Install the clutch actuator cylinder bolts (1).

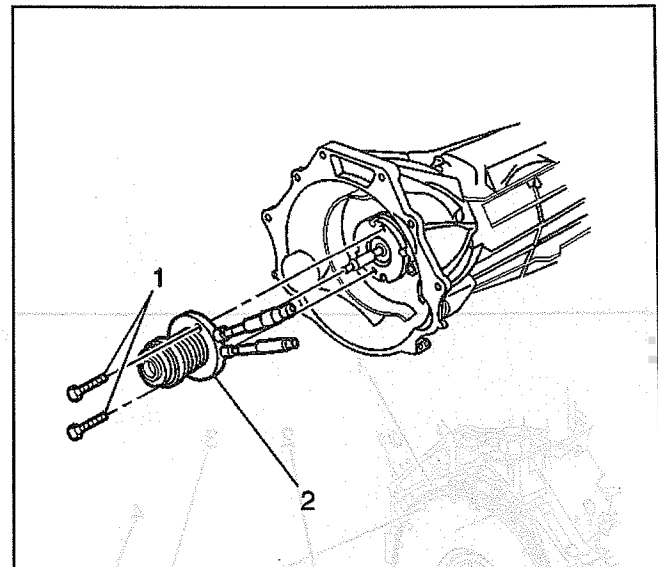
Tighten

Tighten the clutch actuator cylinder bolts (1) to 8 N·m (71 lb in).

4. Install the manual transmission. Refer to *Transmission Replacement* in Manual Transmission - M49 or *Transmission Replacement* in Manual Transmission - MM6.



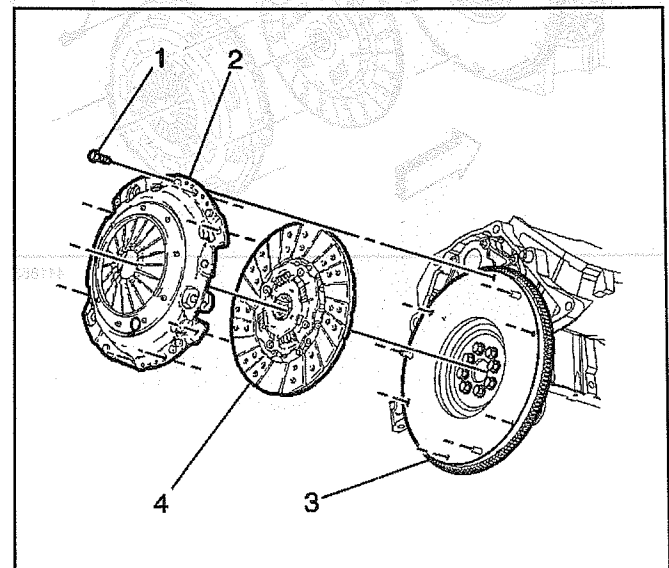
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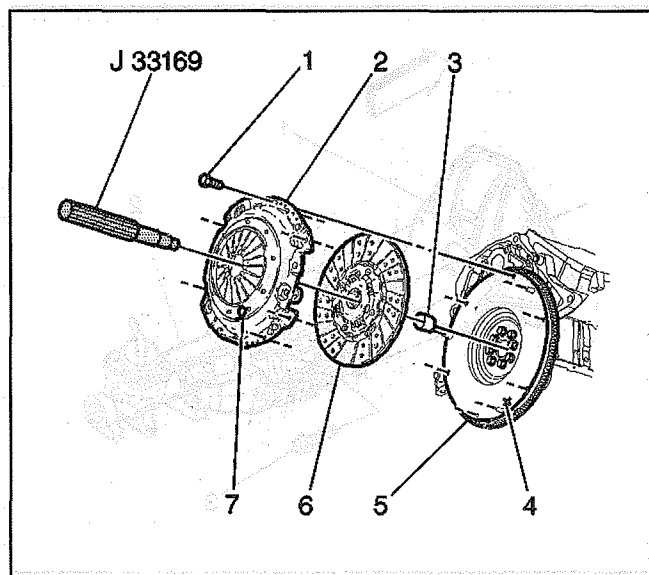
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Clutch Pressure Plate and Clutch Driven Plate (3.8 L)**Removal Procedure**

1. Remove the manual transmission. Refer to *Transmission Replacement* in Manual Transmission - M49.
2. Remove the clutch pressure plate bolts (1).
3. Remove the clutch pressure plate (2) and driven disc (4) from the dowel pins on the flywheel (3).



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Installation Procedure

Tools Required

- J 33169 Clutch Alignment Arbor
- J 36660-A Torque Angle Meter

Important: When the clutch driven plate requires replacement, the engine flywheel must also be replaced along with the clutch pressure plate as an assembly.

1. Install the clutch pressure plate (2) and driven plate (6) to the dowel pins on the flywheel (5).
2. Match the gray paint spot (7) on the pressure plate (2) to the X (4) on the flywheel (5).
3. Install the clutch pressure plate bolts (1) finger tight.
4. Install the J 33169 in order to align the clutch driven plate to the clutch pilot bearing.

Notice: Refer to *Fastener Notice* in Cautions and Notices.

5. Tighten the clutch pressure plate bolts (1).

Tighten

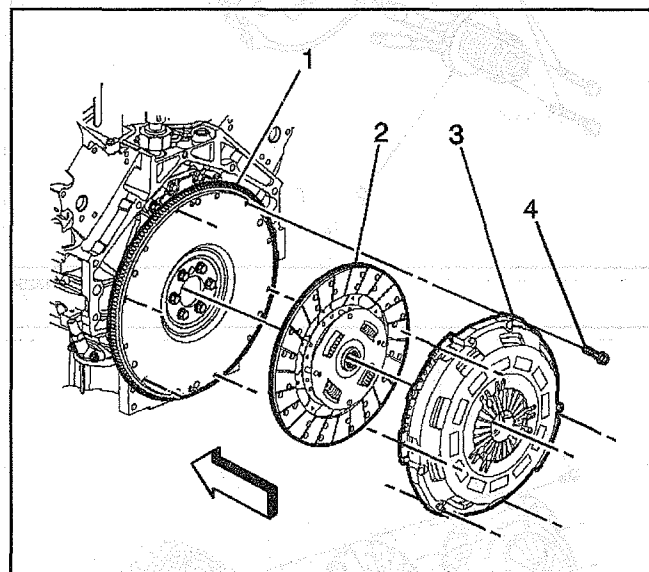
Tighten the clutch pressure plate bolts (1) to 20 N·m (15 lb ft). Use the J 36660-A to torque the clutch pressure plate bolts (1) an additional 45 degrees.

6. Install the manual transmission. Refer to *Transmission Replacement* in Manual Transmission - M49.

Clutch Pressure Plate and Clutch Driven Plate (5.7 L)

Removal Procedure

1. Remove the manual transmission. Refer to *Transmission Replacement* in Manual Transmission - MM6.
2. Remove the clutch pressure plate bolts (4).
3. Remove the clutch pressure plate (3) and driven disc (2) from the dowel pins on the flywheel (1).



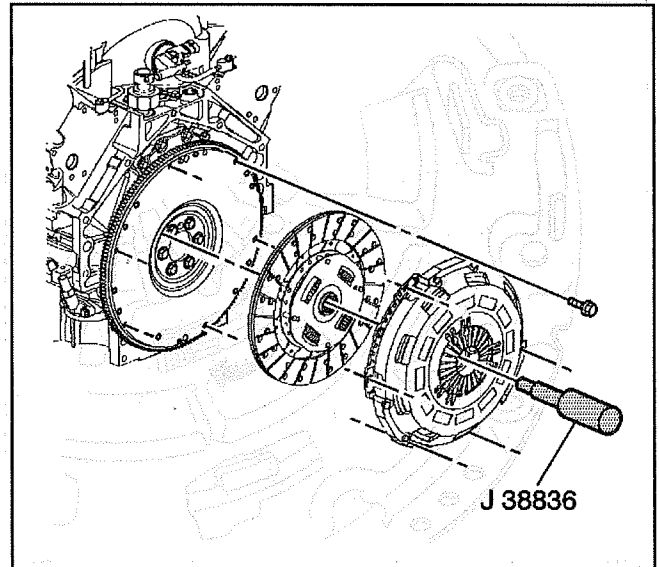
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Installation Procedure**Tools Required**

J 38836 Pilot Bushing Installer/Clutch Alignment Arbor

Important: When the clutch driven plate requires replacement, the engine flywheel must also be replaced along with the clutch pressure plate as an assembly.

1. Install the clutch pressure plate and driven plate to the dowel pins on the flywheel.
2. Install the clutch pressure plate bolts finger tight.
3. Install the J 38836 in order to align the clutch driven plate to the clutch pilot bearing.



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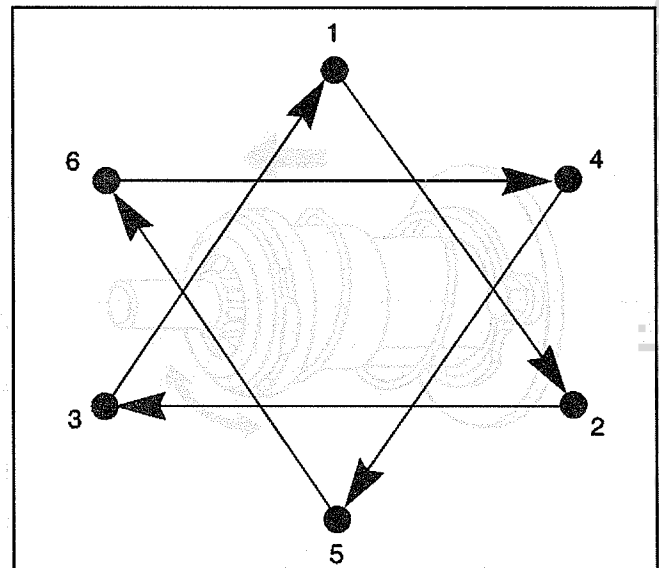
Notice: Refer to *Fastener Notice* in Cautions and Notices.

4. Tighten the clutch pressure plate bolts.

Tighten

Tighten the clutch pressure plate bolts (in sequence shown) to 70 N·m (52 lb ft).

5. Install the manual transmission. Refer to *Transmission Replacement* in Manual Transmission - MM6.

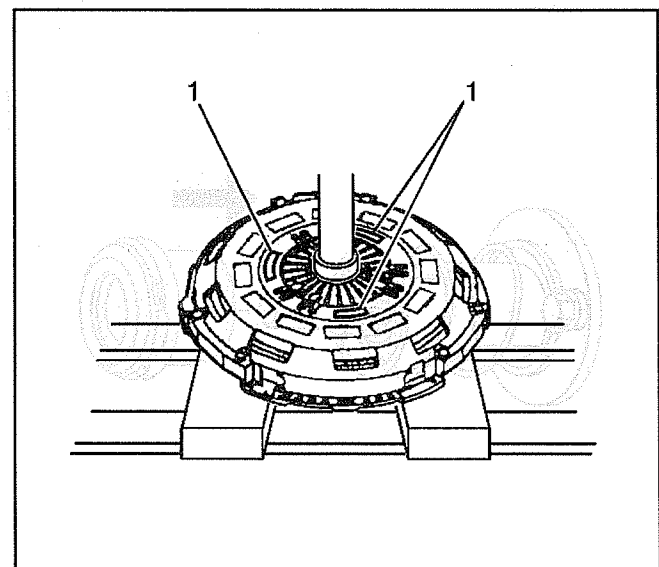


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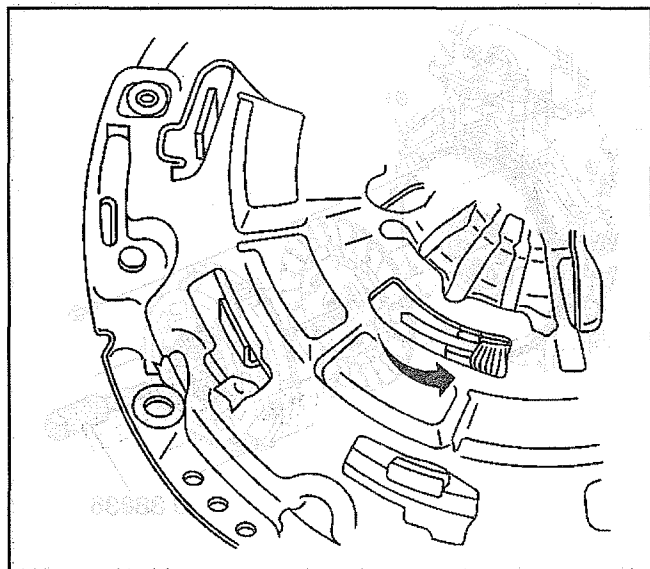
Clutch Pressure Plate Adjustment

Important: Clutch pressure plate adjustment is only necessary when the driven (clutch) disc is worn and the pressure plate has compensated for the worn disc.

1. Place the clutch pressure plate, flat surface down, on a press.
2. Compress the pressure plate diaphragm spring fingers until tension is released from the stepped adjusting ring.
3. Hold 2 screwdrivers or other suitable tools, and place them against 2 of the 3 stepped adjusting ring tension spring stops (1), just ahead of the adjusting ring tension springs.

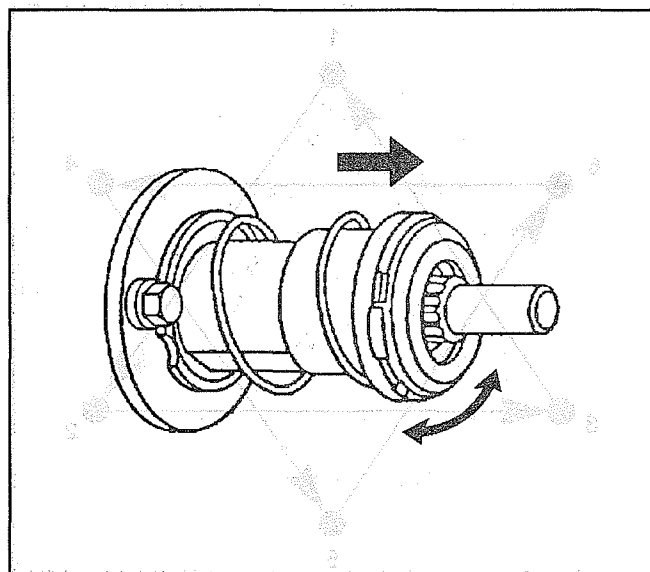


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4. Using the screwdrivers, rotate the stepped adjusting ring counterclockwise (compressing the tension springs) until the adjusting ring steps are fully adjusted out, then continue to hold in position.
5. Release the pressure from the pressure plate diaphragm spring fingers.
6. Release the adjusting ring tension spring stops.
7. Remove the pressure plate from the press.

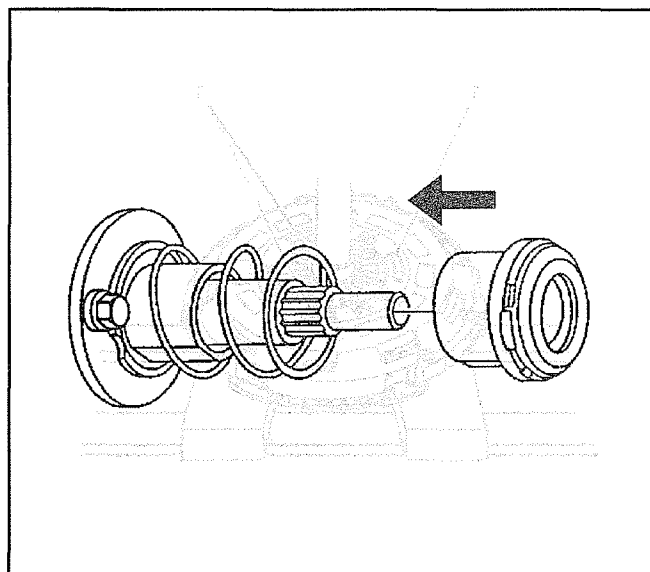


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Release Bearing Replacement

Removal Procedure

1. Remove the manual transmission. Refer to *Transmission Replacement* in Manual Transmission - M49 or *Transmission Replacement* in Manual Transmission - MM6.
2. Remove the clutch release bearing. Rotate the bearing in either direction. The compression spring load will push the release bearing off the end of the clutch actuator cylinder.



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Installation Procedure

Important: DO NOT use cleaners or chemicals to clean the quill and DO NOT grease the quill.

1. Using a clean dry cloth, clean the exposed area of the actuator cylinder quill.

Important: DO NOT grease the new clutch release bearing. The new clutch release bearing to be installed is pre-greased.

2. Install the new clutch release bearing to the clutch actuator cylinder. Firmly push the clutch release bearing into place. The release bearing will snap over the retainer tab and will be self-retained to the actuator cylinder.
3. Install the manual transmission. Refer to *Transmission Replacement* in Manual Transmission - M49 or *Transmission Replacement* in Manual Transmission - MM6.

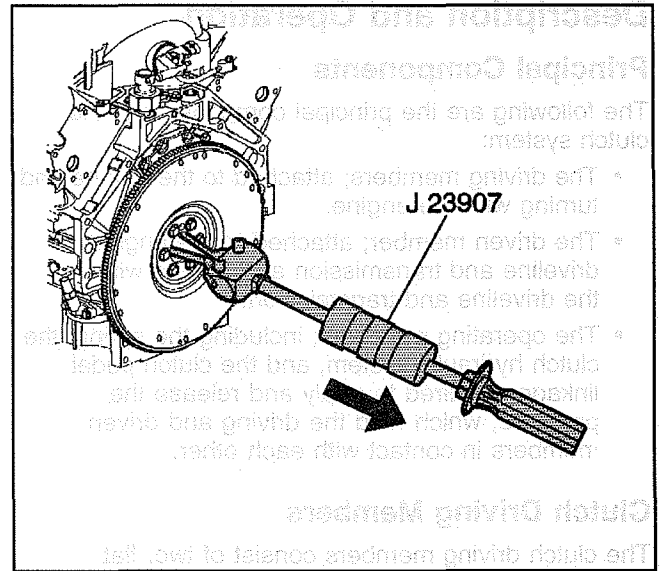
Pilot Bearing Replacement

Removal Procedure

Tools Required

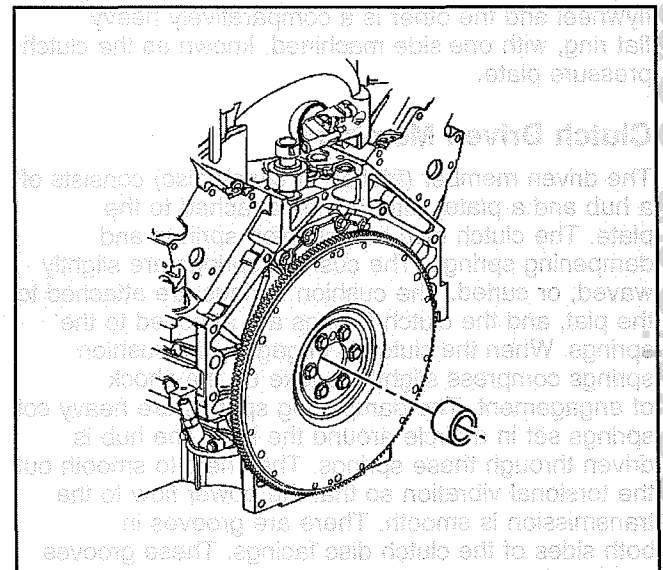
J 23907 Clutch Pilot Bearing Remover

1. Remove the clutch pressure plate and clutch driven plate. Refer to *Clutch Pressure Plate and Clutch Driven Plate (3.8 L)* or *Clutch Pressure Plate and Clutch Driven Plate (5.7 L)*.
2. Using the J 23907, remove the clutch pilot bearing.



Installation Procedure

1. Using a suitable size socket, install the clutch pilot bearing.
2. Install the clutch pressure plate and clutch driven plate. Refer to *Clutch Pressure Plate and Clutch Driven Plate (3.8 L)* or *Clutch Pressure Plate and Clutch Driven Plate (5.7 L)*.



Hydraulic Clutch Description

The clutch hydraulic system consists of a master cylinder and an actuator cylinder. When pressure is applied to the clutch pedal (pedal depressed), the master cylinder pushes the plunger and pushes it down the bore of the master cylinder. In the first 0.8 mm (0.031 in) of movement, the recuperation seal closes the port to the fluid reservoir tank, and as the plunger continues to move down the bore of the cylinder, the fluid is forced through the outlet line to the actuator cylinder. As fluid is pushed down the pipe from the master cylinder, this in turn forces the piston in the actuator cylinder outward. As the actuator cylinder piston moves forward, it forces the release bearing to disengage the clutch pressure plate from the clutch disc. On the return stroke (pedal released), the plunger moves back as a result of the return pressure of the clutch. Fluid returns to the master cylinder and the final movement of the plunger opens the port to the fluid reservoir, allowing an unobstructed flow of fluid between the system and reservoir.

Hydraulic Clutch Fluid Description

When adding, refilling or replacing hydraulic clutch fluid after service operations, use hydraulic clutch fluid that meets GM PN 1234567 or an equivalent fluid that meets DOT 3 specifications only (such as DOT 3 brake fluid).

Clutch Operating Members

The driving member and the driven member are held in contact by spring pressure. This pressure is exerted by a one-piece conical or diaphragm spring. A diaphragm spring is a conical piece of spring steel that has been specially stamped to give it greater flexibility. The diaphragm is positioned between the cover and the pressure plate so that the diaphragm spring is nearly flat when the clutch is in the engaged position. The action of this type of spring is similar to that of an ordinary coil spring.

The clutch driving members consist of two flat, machined, thin plates, machined to a smooth finish. One of these surfaces is the rear face of the engine flywheel and the other is a comparatively heavy cast iron ring with one side machined (known as the clutch pressure plate).

The driven member consists of a hub and a plate. The clutch plate is attached to the flywheel and the hub is attached to the pressure plate. The clutch plate is held in contact with the flywheel and the hub by the action of the clutch pressure plate.

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Description and Operation

Principal Components

The following are the principal components of the clutch system:

- The driving members; attached to the engine and turning with the engine.
- The driven member; attached to the engine driveline and transmission and turning with the driveline and transmission.
- The operating members; including the spring, the clutch hydraulic system, and the clutch pedal linkage, required to apply and release the pressure, which hold the driving and driven members in contact with each other.

Clutch Driving Members

The clutch driving members consist of two, flat surfaced, iron plates, machined to a smooth finish. One of these surfaces is the rear face of the engine flywheel and the other is a comparatively heavy flat ring, with one side machined, known as the clutch pressure plate.

Clutch Driven Members

The driven member (friction or clutch disc) consists of a hub and a plate, with facings attached to the plate. The clutch disc has cushion springs and dampening springs. The cushion springs are slightly waved, or curled. The cushion springs are attached to the plat, and the clutch facings are attached to the springs. When the clutch is engaged, the cushion springs compress slightly to take up the shock of engagement. The dampening springs are heavy coil springs set in a circle around the hub. The hub is driven through these springs. They help to smooth out the torsional vibration so that the power flow to the transmission is smooth. There are grooves in both sides of the clutch disc facings. These grooves prevent the facings from sticking to the flywheel face and pressure plate when the clutch is disengaged. The grooves break any vacuum that might form and cause the facings to stick to the flywheel ore pressure plate.

Clutch Operating Members

The driving member and the driven member are held in contact by spring pressure. This pressure is exerted by a one-piece conical or diaphragm spring.

A diaphragm spring is a conical piece of spring steel that has been specially stamped to give it greater flexibility. The diaphragm is positioned between the cover and the pressure plate so that the diaphragm spring is nearly flat when the clutch is in the engaged position. The action of this type of spring is similar to that of an ordinary oil can.

The pressure of the inner rim of the spring on the pressure plate decreases as the flat position is passed. The inner rim of the diaphragm bears on the pressure plate and is pivoted on a ring on the outer edge of the pressure plate. The application of a pulling load on the inner section of the pressure plate will cause the inner rim to move away from the flywheel and allow the pressure plate to move away from the clutch disc, thereby releasing or disengaging the clutch. When the pressure is released from the inner section, the OIL CAN action of the diaphragm causes the inner section to move in, and the movement of the inner rim forces the pressure plate against the clutch disc, thus engaging the clutch.

The clutch release bearing is moved by the actuator assembly to move the release levers which move the pressure plate to the rear, thus separating the clutch disc from the flywheel when the clutch pedal is depressed by the driver. A piston return spring in the actuator cylinder preloads the clutch linkage and assures a small load on the release bearing with the actuator assembly at all times. As the clutch disc wears, the diaphragm spring fingers move forward forcing the release bearing, actuator assembly, and pushrod to move. This movement forces the actuator cylinder piston to move forward in its bore, consuming hydraulic fluid from the master cylinder reservoir, thereby providing the SELF-ADJUSTING feature of the hydraulic clutch linkage system.

Hydraulic Clutch Description

The clutch hydraulic system consists of a master cylinder and an actuator cylinder. When pressure is applied to the clutch pedal (pedal depressed), the pushrod contacts the plunger and pushes it down the bore of the master cylinder. In the first 0.8 mm (0.031 in) of movement, the recuperation seal closes the port to the fluid reservoir tank, and as the plunger continues to move down the bore of the cylinder, the fluid is forced through the outlet line to the actuator cylinder. As fluid is pushed down the pipe from the master cylinder, this in turn forces the pistons in the actuator cylinder outward. As the actuator cylinder piston moves forward, it forces the release bearing to disengage the clutch pressure plate from the clutch disc. On the return stroke (pedal released), the plunger moves back as a result of the return pressure of the clutch. Fluid returns to the master cylinder and the final movement of the plunger opens the port to the fluid reservoir, allowing an unrestricted flow of fluid between system and reservoir.

Hydraulic Clutch Fluid Description

When adding, refilling or replacing hydraulic clutch fluid after service operations, use hydraulic clutch fluid GM P/N 12345347 or an equivalent fluid that meets DOT 3 specifications only (such as DOT 3 brake fluid)

Special Tools and Equipment

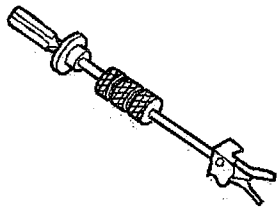
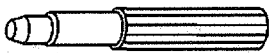
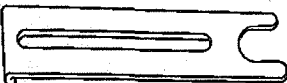
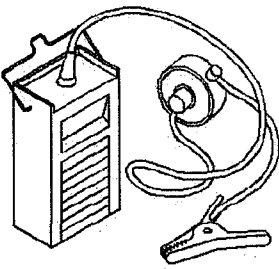
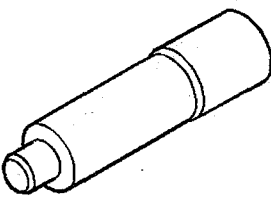
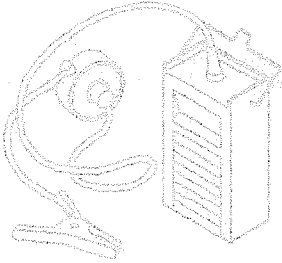
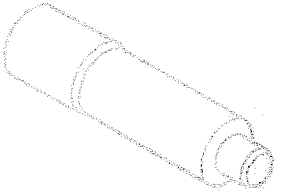
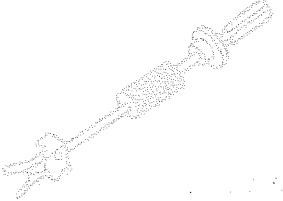
Illustration	Tool Number/ Description
 995	J 23907 Clutch Pilot Bearing Remover
 43268	J 33169 Clutch Alignment Arbor
 105916	J 36221 Hydraulic Clutch Line Separator

Illustration	Tool Number/ Description
 3413	J 36660-A Torque Angle Meter
 18093	J 38836 Pilot Bushing Installer/Clutch Alignment Arbor

Special Tools and Equipment

Tool Number/Description	Illustration
J 36690-A Torque Angle Meter	
J 36693 Pilot Bushing Installer/Clutch Alignment Arbor	

Tool Number/Description	Illustration
J 36697 Clutch Pilot Bearing Remover	
J 36698 Clutch Alignment Arbor	
J 36699 Hydraulic Clutch Line Separator	

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